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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/070,675	03/06/2002	Ronald W Waynant	4239-62279	9478

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EXAMINER	
SOUW, BERNARD E	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 10/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/070,675	WAYNANT, RONALD W	
	Examiner	Art Unit	
	Bernard E Souw	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 March 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 371 (PCT/US00/24308) which papers have been placed of record in the file.

Preliminary Amendment

2. The Preliminary Amendment filed 03/06/2002, Paper #2, has been entered.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 18-20 and 22-26 are rejected under 35 U.S.C. 102(b) as being anticipated by McLean (XP-002154943).

McLean discloses an imaging apparatus & method, comprising:

- an electromagnetic (EM) pulse source (=laser);
- a beam splitter splitting a pulse from the EM pulse source into a first and second portion, the first portion directed toward an object (46) for generating an object image; and

- a microchannel plate (MCP) detector that simultaneously acts as a time-gate for capturing the object image in response to the second pulse portion (=gate pulse).

All the above claim limitations (of claims 18-20 & 22-26) are recited in the Abstract of the McLean prior art.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 18-20 and 22-26 are also rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano et al. (USPAT 5,371,368) hereafter addressed as Alfano'368, in view of Takahashi (USPAT 5,057,680).

Alfano'368 discloses in Fig.3 and recited in Col.5/ll.35-64 an imaging apparatus & method comprising:

- an EM pulse source (=laser) 33;
- a beam splitter splitting a pulse from the EM pulse source 33 into a first (labeled 1054 nm) and second portion (labeled 527 nm), the first portion directed toward an object (46) for generating an object image.

However, Afano'368 does not use a MCP as an image detector. Takahashi discloses an X-ray imaging apparatus using an MCP as a gateable image detector, as recited in the Abstract/ll.3-6. Takahashi's MCP detector simultaneously acts as a time-gate for

capturing the object image in response to the second pulse portion (=gate pulse), as recited in Col.3/ll.17-26.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an MCP as a gateable image detector, since that way the use of a separate triggerable gate, such as a Alfano'368's Kerr cell 36 (Fig.3) having imaging capability, can be spared.

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano'368 in view of Takahashi, and further in view of Duncan et al. (Optics Letters 16 (23), 1991, pp.1868-1870).

Alfano'368 as modified by Takahashi shows all the limitations of claim 21, as previously applied to the parent claim 20, except the recitation of a Raman amplifier to generate the second pulse.

Duncan et al. disclose in Fig.1 on pg. 1869 a Raman generator that produces Stokes components of a Nd:YAG laser beam, as recited on pg.1869, ¶.2.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Duncan's Raman amplifier to generate Stokes component of Takahashi's X-ray (of course with appropriate modifications to accommodate Raman conversion in the X-ray regime, which is well known in the art), since the Raman Anti-Stokes component from the same generator can then be used as a second pulse to reconstruct the desired image with significantly less scattered photon noise.

8. Claims 1, 2, 4, 5, 7 and 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano'368 in view of Hirose et al. (USPAT 5,680,429).

Alfano'368 discloses in Fig.3 and recited in Col.5/ll.35-64 an imaging apparatus & method comprising:

- an EM pulse source (=laser) 33;
- a beam splitter splitting a pulse from the EM pulse source 33 into a first (labeled 1054 nm) and second portion (labeled 527 nm), the first portion directed toward an object (46) for generating an object image.
- A time gate 36 capturing the object image in response to the second pulse portion labeled 527 nm in Fig.3.

However, Afano'368 does not recite using an X-ray source generating a beam in response to the first pulse portion, the beam directed toward an object for generating an object image

Hirose et al. disclose in Fig.5 an X-ray source that can be produced by irradiating laser beam 7 on a target 1, as recited in Col.9/ll.65-67 & Col.10/ll.1-11. Alfano'368's first portion of the laser beam labeled 1054 nm can here be used (after appropriate second or third harmonic generation, as generally known in the art) as Hirose's laser beam 7 to generate a laser-produced-plasma X-ray for imaging Alfano'368's object (diffusive media) in Fig.3.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use laser-generated Hirose's X-ray to make an image of a

diffusive media, since an X-ray is known to have deep penetration capability, so a 3-D image can thus be generated.

► Specifically regarding claim 5, Hirose's target for producing the laser-produced-plasma X-ray is made of Molybdenum, as recited in Col.9/ll.1-5.

► Specifically regarding claim 15, the excellent capabilities of X-rays for 3-D imaging of human tissues, including bones and inner organs, are well known in the art.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano'368 in view of Hirose et al. and further in view of Biswal (USPAT 5,757,839).

Alfano'368 as modified by Hirose et al. shows all the limitations of claim 3, as previously applied to the parent claim 2, except a laser pulse width of about 10-30 fs and a laser pulse energy of at least 125-250 mJ at a rate of about 100-250 pulses per second.

The recited laser parameters are conventional for a state-of-the-art Nd:YAG laser, as disclosed by Biswal et al. in Col.12/ll.35-46.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a state-of-the-art but conventional Nd:YAG laser to substitute Alfano'368's laser in order to produce a laser-produced-plasma X-ray as taught by Hirose, since Biswal's state-of-the-art laser is not only powerful enough but also has a very narrow pulse width in the sub-picosecond order of magnitude appropriate for fast time-gating purposes that is capable of excluding X-ray scattered

from the object and built the image only from ballistic X-rays, such that image noise can be significantly suppressed.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano'368 in view of Hirose et al. and further in view of Takahashi.

Alfano'368 as modified by Hirose et al. shows all the limitations of claim 6, as previously applied to the parent claim 1, except the recitation of a MCP detector. Takahashi teaches the use of a MCP as a time-gateable imaging detector.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Alfano'368's ICDD camera 37 in Fig.3 with a triggerable MCP detector as taught by Takahashi, since an MCP detector is more appropriate (i.e., sensitive) for use in X-ray wavelength region.

11. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano'368 in view of Hirose et al., and further in view of Duncan et al. (Optics Letters 16 (23), 1991, pp.1868-1870).

Alfano'368 as modified by Hirose et al. shows all the limitations of claim 3, as previously applied to the parent claim 2, except the recitation of a Raman amplifier and/or generator to generate the X-ray beam.

Duncan et al. disclose in Fig.1 on pg. 1869 a Raman generator that produces Stokes components of a Nd:YAG laser beam, as recited on pg.1869, ¶.2.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Duncan's Raman generator to generate Stokes component of Hirose's X-ray (of course with appropriate modifications to accommodate Raman conversion in the X-ray regime, which is well known in the art), since the Raman Anti-Stokes component from the same generator can then be used to reconstruct the desired image in a second Raman amplifier in a time-gated manner, this second Raman amplifier thus acting as time-gateable image capturer capable of selecting ballistic image photons and exclude the scattered photons by appropriate time delay.

12. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alfano'368 in view of Hirose et al. and further in view of Klaveness et al. (USPAT 6,159,445), hereafter denoted as Klaveness'445.

Alfano'368 as modified by Hirose et al. shows all the limitations of claims 16 and 17, as previously applied to the parent claim 10, except the recitation of a using a contrast agent. Klaveness'445 discloses the use of an X-ray imaging contrast agent, as recited in the Abstract and in Col.1/ll.17-25.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use X-ray imaging contrast agent for in-vivo imaging of human tissues as taught by Klaveness'445, in order to enhance the X-ray images of soft tissues that are normally of poor-contrasts, and thus, improve the medical diagnostic process.

The remaining limitations of claim 16 and those of claim 17 (capturing a second image and comparing with the first) are essentially a duplication of the previously rejected limitations regarding a single image, without any new or unexpected results, and furthermore, involve only routine skills in the art. Therefore, claims 16 and 17 are rejected as previously applied to the parent claim 10, however, with Klaveness'445 as an additional prior art.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 703 305 0149. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes
September 30, 2003

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
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